PATENT--FEE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:

THOMAS DANIEL ET AL.

Serial No.: 10/521,292

Filed: January 11, 2005

For: **METHOD FOR PRODUCING POLYMERS**

Attorney Docket No. 29827/40753

Group Art Unit: 1713

Examiner: M. Bernshteyn

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Dated: **December 15, 2006**

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APPEAL BRIEF

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Sir:

This Appeal Brief is submitted in triplicate to support the Notice of Appeal, filed in this application on October 11, 2006. This Appeal Brief is accompanied by the fee for filing an Appeal Brief under 37 C.F.R. §1.17(b) and a one-month extension of time under 37 C.F.R. §1.136(a). Accordingly, this Appeal Brief is timely filed.

Any additional required fee may be charged, or any overpayment credited, to Deposit Account No. 13-2855.

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This brief contains the following headings, as required by 37 C.F.R. §41.37 and M.P.E.P. §1205:

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is BASF Aktiengesellschaft (BASF), the assignee of the entire right, title, and interest to the above-identified patent application. The assignment was recorded in the United States Patent and Trademark Office ("USPTO") at Reel 16860, Frame 0509 on August 8, 2005, which constitutes the entire chain of title from the inventors to BASF.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to the appellants, appellants' legal representative, or the assignee which will directly affect or be directly affected by, or have a bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

A. History

This application was originally field with claims 1-10.

B. Current Status of Claims

Claims cancelled: None.

Claims withdrawn from consideration but not cancelled: None.

Claims pending: 1-10.

Claims allowed: None.

Claims rejected: 1-10.

C. Claims on Appeal

The claims on appeal are claims 1-10.

IV. STATUS OF AMENDMENTS

Applicants filed an after-final amendment on September 19, 2006. The amendment was entered, as indicated in the Advisory Action mailed September 28, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellants provide the following description of the standard method of preparing superabsorbent polymers (SAPs) and of the presently claimed method. This description is provided to more clearly explain the presently claimed invention, to demonstrate the differences between the standard preparation method and

the presently claimed method, and to demonstrate the benefits achieved by the presently claimed invention.

Standard method of preparing SAP

SAPs typically are prepared by neutralizing an aqueous *solution* of acrylic acid to about 75 to about 100 mol% by adding sodium hydroxide, or a similar base, to an *aqueous solution* of acrylic acid, or vice verse, by adding acrylic acid to an aqueous sodium hydroxide solution. This neutralization is conducted *in situ* to provide a monomer solution having the desired weight percent of monomer at the desired mole % neutralization. The neutralized acrylic acid then is polymerized.

Because of the extremely high reactivity of unneutralized acrylic acid (AA), commercial AA contains a stabilizer to control premature polymerization. Unless removed from the AA, the stabilizers impart a color to SAPs. At times, the stabilizers are removed by distillation or absorption. Alternatively, the AA is polymerized immediately after synthesis. See specification, page 1, lines 36-44.

Acrylic acid also dimerizes during storage, which presents a different problem. The AA dimer can polymerize. However, during subsequent process steps (e.g., drying) and/or storage, the AA dimer present in the SAP cleaves to regenerate monomeric AA, which appears as residual AA in the final SAP product.

An example of the standard process for preparing an SAP is set forth in the specification as "Comparative example 1" at pages 5 and 6. Note that

the AA is neutralized in solution with aqueous sodium hydroxide to provide a *solution* of neutralized sodium acrylate (specification, page 5, lines 37-44). The sodium acrylate *solution* then was polymerized (page 6, lines 1-20). A *solid* sodium acrylate was *not* used in the polymerization.

Presently claimed method of preparing SAP

The present method overcomes the problems of the standard method of preparing SAPs related to discoloration from the AA stabilizer and residual AA from AA dimer formation. In particular, these problems are avoided by adding *solid* sodium acrylate to the solution used in the polymerization step. In particular, AA is neutralized with sodium hydroxide (or similar base) to provide an aqueous solution of sodium acrylate. The sodium acrylate *then is precipitated* from the aqueous solution by the addition of an alcohol, and is *separated* and *dried* to provide *anhydrous* sodium acrylate. The impurities found in acrylic acid, i.e., stabilizers, AA dimers, and other unidentified impurities, remain in solution and do not precipitate with the sodium acrylate.

The resulting *purified* and *solid* sodium acrylate then is used in the polymerization reaction to produce an SAP hydrogel. The sodium acrylate can be anhydrous, if freshly prepared or protected from the atmosphere, or can contain from 0.1% to 10%, by weight, water because sodium acrylate is hydroscopic. Regardless, the sodium acrylate used to prepare the monomer solution is a *solid* and eliminates the above-

described impurities found in AA from the polymerization process.

The specification provides an example of the claimed method of producing an SAP at page 7. Note that *unlike* Comparative example 1 discussed above (in which sodium acrylate was produced *in situ* and directly used), the inventive example used *solid* sodium acrylate to prepare the monomer solution (page 7, lines 3-7). The data in the specification shows that the inventive method substantially reduced the amount of residual AA monomer and had a better, i.e., whiter, color.

Therefore, using solid sodium acrylate in a polymerization process to provide an SAP hydrogel, as opposed to using the sodium acrylate prepared *in situ*, yields an SAP of improved color and reduced residual monomer content. See, specification, page 2, lines 1-4. The solid sodium acrylate utilized in the present invention is discussed in the specification, page 2, line 14 through page 3, line 7.

Accordingly, the method of independent claim 1 recites a process for producing a sodium acrylate polymer by a free radical polymerization of sodium acrylate, either alone or with other monomers, in an aqueous medium. The claimed process expressly recites using *solid* sodium acrylate, wherein the *solid* sodium acrylate is dissolved or dispersed in the aqueous medium. See specification, page 2, lines 6-12.

Claims 2-4 recite different degrees of neutralization for the sodium acrylate and the acrylic acid used in the free radical polymerization. See specification, page 3, lines 3-7.

Claim 5 recites including a monomer containing at least two ethylenically unsaturated double bonds, i.e., a crosslinking agent, in the aqueous solution subjected to the free radical polymerization. See specification, page 3, line 39 through page 4, line 9.

Claims 6 and 7 recite the water content of the solid sodium acrylate, i.e., anhydrous sodium acrylic in claim 6 and 0.1% to 10%, by weight, water in claim 7. See specification, page 2, line 31-35.

Claim 8 recites a sodium acrylate polymer prepared by the process of independent claim 1. See specification, Inventive example 1, page 7, lines 1-26.

Independent claim 9 recites a method of producing a polymer from *solid* sodium acrylate comprising dissolving the sodium acrylate in water to form an aqueous monomer solution, then polymerizing the monomer solution. The sodium acrylate can be the sole monomer, or other monomers can be present. See specification, page 2, line 40 through page 3, line 16 and Inventive example, page 7, lines 1-26.

Claim 10 recites that the solid sodium acrylate can be partially or wholly replaced by another solid water-soluble salt of acrylic acid. See specification, page 3, lines 31-37.

VI. ISSUES TO BE REVIEWED ON APPEAL

A. Whether claims 1-5 and 8-10 are anticipated under 35 U.S.C. §102(b) by Tsubakimoto et al. U.S. Patent No. 4,286,082 ('082).

B. Whether claims 6 and 7 are anticipated under 35 U.S.C. §102(b), or alternatively are obvious under 35 U.S.C. §103, by the '082 patent.

VII. ARGUMENT

A. It is axiomatic that a claim is anticipated only if each and every element as set forth in the claim is found, either expressively or inherently described, in a single prior art reference. In addition, the identical invention must be shown in as complete detail as is contained in the claim. M.P.E.P. §2131.

The rejection of claims 1-5 and 8-10 as being anticipated under 35 U.S.C. §102(b) by the '082 patent must be withdrawn because the '082 patent fails to disclose each and every element recited in the claims.

In particular, the '082 patent fails to anticipate claims 1-5 and 8-10, or render claims 1-5 and 8-10 obvious, because the reference fails to disclose or suggest the recited feature of using solid sodium acrylate to produce a sodium acrylate polymer.

The '082 patent is directed to a method of producing an absorbent resin in the presence of a surfactant. The '082 patent discloses the above-described standard prior art method of preparing an SAP, wherein a solution of AA is partially neutralized with sodium hydroxide to provide a monomer solution containing sodium acrylate and unneutralized AA. The sodium acrylate is prepared *in situ* and is not added to the monomer solution as a *solid*, which is a recited element of each of the original and pending claims.

In particular, the '082 patent, at column 3, lines 20-22, states that the "acrylate salt monomer (B) used in the present invention is composed of 0 to 50 mol % of acrylic acid and 50 to 100 mol% of an alkali metal acrylate." The '082 patent does not disclose how this monomer (B) was produced. The examples of '082 further state that a solution of sodium acrylate and AA was used (e.g., Example 1, column 7, lines 32-38). The '082 patent contains *no* express or inherent disclosure relating to using a *solid* sodium acrylate as the source of a monomer in the preparation of an SAP.

Because a reference *must* teach *every* element of a claim in order for the reference to anticipate the claim, because the identical invention must be shown *in as complete a detail* as is contained in the claims, and because the '082 patent fails to teach or suggest using *solid* sodium acrylate to form the monomer solution, as presently claimed, the '082 patent cannot anticipate claims 1-5 and 8-10.

The examiner relies upon *In re Schaumann* 572 F.2d 312 (CCPA 1978) to support the anticipation rejection under 35 U.S.C. §102(b). It is submitted that reliance upon this decision is misplaced. That case involved specifically a claimed *compound* falling within a generic formula of a cited reference, which embraced a limited number of related compounds. In that case, the claimed subject matter was *specifically* disclosed in the reference, which is not situation at bar. The present situation is more like *Akzo N.V. v. International Trade Comm'n*, 808 F.2d 1471 (Fed Cir. 1986) in which a disclosure of using sulfuric acid

solution did *not* anticipate a method using 98% sulfuric acid because the reference did *not* disclose 98% sulfuric acid.

In the Advisory Action, the examiner refutes Applicants statement regarding *Akzo N.V. v. U.S. Int'l Trade Comm'n*, (808 F.2d 1471 Fed. Cir. 1986) stating:

> It is noted that Tsubakimoto et al ('082 patent) discloses that an aqueous solution can contains [sic] 100 mol% of an alkali metal acrylate. (abstract). Therefore, the reference clearly discloses that the source of a monomer is a solid sodium acrylate, which is substantially identical with the claimed invention."

The examiner totally misreads the meaning of "100 mol% of an alkali metal acrylate" in the '082 patent. This phrase relates to the *degree of neutralization (DN)* of the acrylic acid, *not* to whether the solid acrylate is a solid. A *solution* of acrylic acid can be unneutralized, i.e., 0 mol% neutralized or DN 0; or can be neutralized with an equimolar amount of a base, i.e., 100 mol % neutralized or DN 100. The DN also can be any number between 0 and 100 when the moles of base used are less than moles of base used are less than the moles of acrylic acid, or can be greater than 100 when the moles of base are greater than the moles of acrylic acid.

It must be understood that this can *all* be in solution, and being 100% neutralized does not mean that the sodium acrylate of DN 100 is a solid. Note that the '082 patent at column 3, lines 20-41 discloses that the acrylic acid can be 50 to 100 mol% of an alkali

metal acrylate. There is *no* disclosure of using solid sodium acrylate, but merely using an acrylic acid having a neutralization of 50 to 100 mol %. In fact, the examiner himself states in the Advisory Action that "an *aqueous* solution can contains [sic] 100 mol % of an alkali metal acrylate." The '082 patent merely discloses a sodium acrylate *solution*, but fails to teach how the solution came to be 100% neutralized. Persons skilled in the art would read the '082 patent as teaching the standard method of preparing an SAP, i.e., neutralizing acrylic acid in *solution*.

Because the '082 patent fails to disclose every element recited in the present claims, the '082 patent cannot anticipate the claims 1-5 and 8-10 under 35 U.S.C. §102(b). It is further submitted that present claims 1-5 and 8-10 would not have been obvious over the '082 patent.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The burden is

initially on the examiner, but once established the *prima facie* case of obviousness must be rebutted by the applicant.

To reach a proper determination under 35 U.S.C. § 103(a), the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicants' disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art. MPEP § 2142.

First, as discussed above, the '082 patent fails to teach or suggest using a solid sodium acrylate as a component to form a monomer solution. Persons skilled in the art would not have been motivated to use solid sodium acrylate to form the monomer solution from the teachings of the '082 patent, which does not even consider or address problems related to the source of the alkali metal acrylate, e.g., discoloration and excess residual monomers in the SAP, let alone teach or

suggest any way to overcome these problems. The '082 patent is silent with respect to the source of the sodium acrylate used in the monomer solution, and it can rightly be stated that the '082 patent is directed to the standard method of providing an alkali metal acrylate, i.e., an *in situ* neutralization of AA.

Second, the presently claimed invention provides unexpected results. As demonstrated by the example and comparative example in the specification, SAPs prepared according to the presently-claimed process contain less residual monomer and have an improved white color compared to SAPs prepared from a sodium acrylate prepared *in situ*. These unexpected results are based on using solid sodium acrylate, which has a reduced level of impurities. As disclosed in the specification (page 1, lines 9 to 17), solid sodium acrylate can be prepared by precipitation from methanolic solutions. Acrylic acid contains impurities that are removed by precipitation of solid sodium acrylate. The precipitation step acts as purification step, and the precipitated solid sodium acrylate does not deteriorate on storing.

Third, the '082 patent provides no motivation or incentive for a person skilled in the art to *add* process steps to the manufacture of an SAP. The '082 patent merely teaches the use of a solution of sodium acrylate. The '082 patent provides no incentive for a person skilled in the art to prepare sodium acrylate, then precipitate and isolate the sodium acrylate, and then *redissolve* the sodium acrylate for polymerization. There is absolutely no teaching or suggestion the '082

patent that would lead a person skilled in the art to perform these extra process steps.

Persons skilled in the art, after reading the '082 patent, would have had no motivation or incentive to substitute a solid sodium acrylate for sodium acrylate prepared *in situ* with any reasonable expectation of achieving the new and unexpected results achieved by SAPs prepared by the claimed method. The '082 patent simply provides no motivation for a person skilled in the art to vary from the standard procedure of generating sodium acrylate *in situ*, and absolutely provides no suggestion or hint that a change from this standard procedure would provide whiter SAPs having improved whiteness and a reduced amount of residual monomers.

In summary, for the reasons set forth above, not only are claims 1-5 and 8-10 novel over the '082 patent, but the these claims also would not have been obvious over the '082 patent under 35 U.S.C. §103. The cited reference simply does not teach, suggest, or even address, using a solid sodium acrylate in the preparation of an SAP.

B. The '082 patent fails to anticipate claims 6 and 7, or render claims 6 and 7 obvious, because the reference fails to disclose or suggest the recited feature of using solid sodium acrylate.

Claims 6 and 7 depend from claim 1 and recite preferred embodiments of the present invention. As such, claims 6 and 7 and do not rely upon the amount of water in the solid sodium acrylate as the sole point of patentability. Applicants, however, rely both upon the

the features recited in claim 6 or 7 *and* the features recited in claim 1.

The reasons why claims 6 and 7 are patentable over the '082 patent under 35 U.S.C. §102(b) and 35 U.S.C. §103 are identical to the reasons that claims 1-5 and 8-10 are patentable over the cited reference. Accordingly, applicants incorporate by reference the reasoning presented above with respect to address the patentability of claims 1-5 and 8-10 to the patentability of claims 6 and 7.

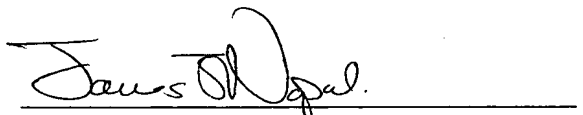
In summary, claim 1 has been shown above to be allowable. Therefore, dependent claims 6 and 7 are patentable as depending from an allowable base claim and as defining further distinctions over the cited reference.

CONCLUSION

In view of the foregoing remarks, Appellants respectfully request that the Board reverse the final rejection of claims 1-10 over the cited '082 patent, and that all pending claims should be allowed.

Respectfully submitted,

MARSHALL, GERSTEIN & BORUN LLP

By 

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APPENDIX A

Claims on Appeal in Application
Serial No. 10/521,292

1. (Previously presented) A process for producing a sodium acrylate polymer by a free-radical polymerization of sodium acrylate with or without other monomers in an aqueous medium, which comprises using solid sodium acrylate in an aqueous solution or dispersion by dissolving or dispersing the solid sodium acrylate in the aqueous medium.

2. (Previously presented) The process of claim 1 wherein the aqueous solution of sodium acrylate contains from 10 to 100 mol% of sodium acrylate and from 0 to 90 mol% of acrylic acid.

3. (Previously presented) The process of claim 1 wherein the aqueous solution of sodium acrylate contains from 10 to 95 mol% of sodium acrylate and from 5 to 90 mol% of acrylic acid.

4. (Previously presented) The process of claim 1 wherein the aqueous solution of sodium acrylate contains from 40 to 90 mol% of sodium acrylate and from 10 to 60 mol% of acrylic acid.

5. (Previously presented) The process of claim 1 wherein the aqueous solution contains from 0.01 to 5 mol% of a monomer containing at least two ethylenically unsaturated double bonds.

6. (Previously presented) The process of claim 1 wherein the aqueous monomer solution is prepared using solid anhydrous sodium acrylate.

7. (Previously presented) The process of claim 1 wherein the solid sodium acrylate has a water content from 0.1% to 10% by weight.

8. (Previously presented) A sodium acrylate polymer prepared by the process of claim 1.

9. (Previously presented) A method of producing a polymer from solid sodium acrylate comprising dissolving the solid sodium acrylate in water to form an aqueous monomer solution and polymerizing the monomer solution in the presence or absence of other monomers.

10. (Previously presented) The process of claim 1 wherein the solid sodium acrylate is wholly or partly replaced by another water-soluble salt of acrylic acid.

APPENDIX B

EVIDENCE APPENDIX

No evidence is submitted pursuant to §§1.130, 1.131, or 1.132.

APPENDIX C

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.